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МЕЖДУНАРОДНАЯ ОРГАНИЗАЦИЯ ПО СТАНДАРТИЗАЦИИ

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**Metallic flanges —**

**Part 2:**  
**Cast iron flanges**

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*Brides métalliques —*

*Partie 2: Brides en fonte*

ISO 7005-2:1988

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## Contents

	Page
Foreword .....	iii
Introduction .....	iv
<b>Section 1: General</b> .....	<b>1</b>
1.1 Scope .....	1
1.2 Normative references .....	1
1.3 Definitions and designations .....	1
<b>Section 2: General requirements</b> .....	<b>3</b>
2.1 Pressure/temperature ( $p/T$ ) ratings .....	3
2.2 Materials .....	3
2.3 Dimensions .....	3
2.4 Joint facings .....	3
2.5 Spot-facing or back-facing .....	4
2.6 Marking .....	4
2.7 Inspection and test .....	4
2.8 Repairs .....	4
2.9 Information to be supplied by the purchaser .....	4
<b>Section 3: Dimensions</b> .....	<b>7</b>
<b>Section 4: Materials and pressure/temperature (<math>p/T</math>) ratings</b> .....	<b>29</b>
4.1 Materials .....	29
4.2 Pressure/temperature ratings .....	30
<b>Annexes</b>	
<b>A</b> Guidance on tolerances of dimensions .....	<b>32</b>
<b>B</b> Bibliography .....	<b>34</b>

## Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

Draft International Standards adopted by the technical committees are circulated to the member bodies for approval before their acceptance as International Standards by the ISO Council. They are approved in accordance with ISO procedures requiring at least 75 % approval by the member bodies voting.

International Standard ISO 7005-2 was prepared by Technical Committee ISO/TC 5, *Ferrous metal pipes and metallic fittings*.

This part of ISO 7005, together with parts 1 and 3, cancel and replace ISO 2084 : 1974, ISO 2229 : 1973 and ISO 2441 : 1975.

ISO 7005 will consist of the following parts, under the general title *Metallic flanges* :

- Part 1: Steel flanges
- Part 2: Cast iron flanges
- Part 3: Copper alloy and composite flanges
- Part 4: Aluminium and aluminium alloy flanges

Annexes A and B of this part of ISO 7005 are for information only.

## Introduction

Various flange systems based on differing design criteria have been in use throughout the world for many years. Given the increasing difficulties arising from such a situation, this International Standard has been based on a single series of metallic flanges. ISO 7005 will be published in four parts as follows:

Part 1: Steel flanges

Part 2: Cast iron flanges

Part 3: Copper alloy and composite flanges

Part 4: Aluminium and aluminium alloy flanges

This part of ISO 7005 is based on the American and European cast iron flange systems which have been combined to produce one International Standard with some changes to the dimensions specified in the two systems.

The materials specified in American (ANSI) standards and International Standards have been retained. Because, at this time, the International Standards for cast iron materials do not specify pressure/temperature ( $p/T$ ) ratings, the ratings for the materials specified have been based on those given in comparable national standards.

In the American system, flanges are designated by a Class rating but in this part of ISO 7005 the relevant Class ratings are designated by nominal pressure (PN) ratings. The equivalent designations are as follows:

Classes 125 and 150: ISO PN20

Classes 250 and 300: ISO PN50

The ratings used in the European system remain as ISO PN2,5, ISO PN6, ISO PN10, ISO PN16, ISO PN25 and ISO PN40.

ISO PN20 and ISO PN50 grey cast iron and ductile cast iron flanges are designed to be interchangeable with flanges to ANSI B16.1 (grey cast iron) and ANSI B16.42 (ductile cast iron). They are not identical but are deemed to comply with the dimensions specified in ANSI B16.1 and ANSI B16.42 as appropriate (see 2.7).

Flange details in all four parts of ISO 7005 are such that flanges having the same PN and nominal size (DN) values and compatible flange facings will mate together when using metric bolting. Tolerances on dimensions are given for guidance in annex A.

To avoid any possible confusion in giving descriptive names to flanges, all flanges are designated by type numbers and flange facings are designated by a letter.

Users of this part of ISO 7005 should satisfy themselves that the flanges comply with any statutory requirements.

# Metallic flanges —

## Part 2: Cast iron flanges

### Section 1 : General

#### 1.1 Scope

This part of ISO 7005 for a single system of flanges specifies requirements for circular grey, malleable and ductile cast iron flanges in the following nominal pressure ratings:

Series 1*	Series 2*
ISO PN10	ISO PN2,5
ISO PN16	ISO PN6
ISO PN20	ISO PN25
ISO PN50	ISO PN40

This part of ISO 7005 specifies the types of flanges and their facings, dimensions, bolt sizes, surface finish of faces, marking, testing, inspection and materials together with associated pressure/temperature ratings.

#### NOTES

- Attention is drawn to the need to refer to the pressure/temperature rating tables for the permissible working pressures, particularly for flanges of ISO PN20 and ISO PN50.
- Dimensions of gaskets will be the subject of a future International Standard.

#### 1.2 Normative references

The following standards contain provisions which, through reference in this text, constitute provisions of this part of ISO 7005. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO 7005 are encouraged to investigate the possibility of applying the most recent editions

of the standards listed below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO 185 : 1988, *Classification of grey cast iron.*

ISO 887 : 1983, *Plain washers for metric bolts, screws and nuts — General plan.*

ISO 1083 : 1987, *Spheroidal graphite cast iron — Classification.*

ISO 2531 : 1986, *Ductile iron pipes, fittings and accessories for pressure pipelines.*

ISO 5922 : 1981, *Malleable cast iron.*

ISO 6708 : 1980, *Pipe components — Definition of nominal size.*

ISO 7268 : 1983, *Pipe components — Definition of nominal pressure.*

ASTM A 126 : 1984, *Gray iron castings for valves, flanges, and pipe fittings.*

ASTM A 395 : 1980, *Ferritic ductile iron pressure-retaining castings for use at elevated temperatures.*

#### 1.3 Definitions and designations

##### 1.3.1 Definitions

For the purposes of this part of ISO 7005, the definitions of nominal size (DN) as given in ISO 6708, and nominal pressure (PN) as given in ISO 7268, apply.

NOTE — In this part of ISO 7005, nominal pressure is designated by the letters "ISO PN" followed by the appropriate reference number.

\* Series 1 ratings are the basic ratings; series 2 ratings have limited application.

**1.3.2 Designation of types and facings**

Figure 1 illustrates flanges identified according to type.

05 — Blank flange

11 — Welding neck flange

12 — Hubbed slip-on flange for welding

13 — Hubbed threaded flange

14 — Hubbed socket welding flange

15 — Loose hubbed flange for lapped pipe end

21 — Integral flange

Figure 2 illustrates facing types (type A and type B) which are used where applicable in conjunction with flanges shown in figure 1.

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## Section 2: General requirements

### 2.1 Pressure/temperature ( $p/T$ ) ratings

#### 2.1.1 General

The pressure/temperature ratings of the flanges manufactured from the materials specified in table 14 shall be the maximum allowable non-shock working pressures at the temperatures given in tables 15 (grey cast iron), 16 and 17 (ductile cast iron) and 18 (malleable cast iron). Linear interpolation is permitted for intermediate temperatures.

NOTE — The rating of a flange is not necessarily the rating of the whole pipework system.

#### 2.1.2 Rating of flanged joints

Where two flanges in a flanged joint do not have the same pressure/temperature rating, the rating of the joint at any temperature shall not exceed the lower of the two flange ratings at that temperature.

#### NOTES

1 The temperature shown for a corresponding pressure rating is considered to be the same as that of the contained fluid. Use of a pressure rating corresponding to a temperature other than that of the contained fluid is the responsibility of the user, subject to the requirements of any applicable code or regulation.

2 Application of the ratings given in this part of ISO 7005 to flange joints should take into consideration the risk of leakage due to forces and moments developed in the connecting pipework.

3 Owing to the nature of any thread sealant used, additional limitations may be placed on a threaded flange.

4 These notes on service considerations are not intended to be exhaustive.

### 2.2 Materials

#### 2.2.1 Range of materials

Flanges shall be manufactured from the materials specified in table 14.

#### NOTES

1 It is the responsibility of each national standards organization to determine which are the national materials equivalent to materials specified in this part of ISO 7005.

2 Where there is an appropriate application standard, it is the responsibility of the purchaser to ensure compliance with the requirements of that standard.

#### 2.2.2 Gaskets

The various types, dimensions and materials used for gaskets are not within the scope of this part of ISO 7005.

### 2.2.3 Bolting

#### NOTES

1 Bolting materials are not within the scope of this part of ISO 7005 but materials for bolting should be chosen by the user according to the pressure, flange material and the selected gasket so that the flanged joint remains tight under the expected operating conditions.

2 For joints comprising grey cast iron flanges with raised faces, and where grey cast iron flanges are bolted to flanges of other materials and either or both of the flanges have a raised face, it is recommended that bolting having a yield strength not exceeding 240 N/mm<sup>2</sup> should be used. If higher strength bolting is used, it is recommended that mating flanges should have flat faces and that full-face gaskets, which extend to the outside diameter of the flange, should be used.

### 2.3 Dimensions

#### 2.3.1 Range of nominal sizes

The range of nominal sizes applicable to each flange type and to each pressure rating shall be as specified in tables 2 to 4 as appropriate.

#### 2.3.2 Dimensional details

Dimensions of flanges shall be in accordance with the following tables, as appropriate:

table 6 for ISO PN2,5 flanges

table 7 for ISO PN6 flanges

table 8 for ISO PN10 flanges

table 9 for ISO PN16 flanges

table 10 for ISO PN20 flanges

table 11 for ISO PN25 flanges

table 12 for ISO PN40 flanges

table 13 for ISO PN50 flanges

NOTE — Tolerances on dimensions are not specified in this part of ISO 7005 but guidance on the dimensions which should have tolerances and suggested tolerances are given in annex A.

#### 2.3.3 Attachment of welded and threaded flanges

NOTE — Details of attachment for welded and threaded flanges are not specified in this part of ISO 7005.

### 2.4 Joint facings

#### 2.4.1 Types of facings

The flange facings specified (flat face type A and raised face type B) are illustrated in figure 2; their raised face dimensions shall be as given in table 5.

NOTE — The transition from the outside diameter of the raised face to the flange face is at the option of the manufacturer (i.e. either a radius or a chamfer may be used).

**2.4.2 Application**

**2.4.2.1** ISO PN2,5, ISO PN6, ISO PN10, ISO PN16, ISO PN25 and ISO PN40 flanges made of grey cast iron and ductile cast iron shall have raised faces.

**2.4.2.2** ISO PN20 flanges made of grey cast iron shall have flat faces. ISO PN50 flanges made of grey cast iron shall have raised faces unless otherwise specified.

ISO PN20 and ISO PN50 flanges made of ductile cast iron shall have raised faces unless otherwise specified.

**2.4.2.3** Flanges made in malleable cast iron shall have either

- a) flat faces, or
- b) raised faces.

**2.4.3 Surface finish of flanges**

All flange jointing faces shall be finished in accordance with table 1. The faces shall be compared by visual or tactile means with reference specimens which conform with the  $R_a$  and  $R_z$  values given in table 1.

**NOTES**

- 1 It is not intended that instrument measurements are taken on the flange faces, and the  $R_a$  and  $R_z$  values as defined in ISO 468 : 1982, *Surface roughness — Parameters, their values and general rules for specifying requirements*, relate to the reference specimens.
- 2 Other finishes may be agreed between the manufacturer and purchaser.

**Table 1 — Numerical values of the surface finish parameters,  $R_a$  and  $R_z$ , of flange faces**

Values in micrometres

Manufacturing process	$R_a$	$R_z$
Turning <sup>1)</sup>	3,2 to 12,5	12,5 to 50
Other <sup>2)</sup>	3,2 to 6,3	12,5 to 25

1) "Turning" covers any method of machine operation producing either serrated concentric or serrated spiral grooves.  
 2) Processes other than turning are permissible provided that they give a surface finish in compliance with the  $R_a$  and  $R_z$  values specified.

**2.5 Spot-facing or back-facing**

Any spot-facing or back-facing required shall not reduce the flange thickness to less than the thickness specified. When spot-facing is used, the diameter shall be large enough to accommodate the outside diameter of the equivalent normal series of washers complying with ISO 887 for the bolt size being fitted. When a flange is back-faced, it is permissible for the fillet radius to be reduced but it shall not be eliminated entirely. The bearing surfaces for the bolting shall be parallel to the flange face within 2°.

**2.6 Marking**

**2.6.1 Identification**

Flanges other than integral shall be clearly marked as follows :

- a) the nominal size (DN) and the nominal pressure rating (ISO PN);
- b) material designation;
- c) manufacturer's name or trade-mark.

**EXAMPLE**

**DN 300 ISO PN16 400-5 XXXX**

**NOTES**

- 1 Additionally, flange facing designations may be given.
- 2 Where a flange is subsequently used to form an integral part of a component and the component has a lower pressure rating than that of the flange, the lower rating should be clearly marked on the component and the lowest  $p/T$  rating will apply.

**2.6.2 Stamping**

Where steel stamps are used, the marking shall be positioned on the rim of the flange.

**2.7 Inspection and test**

ISO PN20 and ISO PN50 flanges specified are designed to be interchangeable with, but not identical to, grey cast iron Class 125 and Class 250 flanges to ANSI B16.1 respectively and with ductile cast iron Class 150 and Class 300 flanges to ANSI B16.42 respectively.

**NOTES**

- 1 It is recommended that ISO PN20 and ISO PN50 flanges be accepted by inspectors as complying with the dimensions specified in ANSI B16.1 or ANSI B16.42 as appropriate.
- 2 This part of ISO 7005 does not make provision for routine inspection or pressure testing of separate flanges. However, flanges may be required to be pressure tested after attachment to a pipe or other equipment or when forming an integral part of such equipment. The test pressure is then dependent on the requirements of the appropriate standard or code of practice in accordance with which the equipment has been manufactured.

**2.8 Repairs**

Where not otherwise prohibited by the applicable material standard or codes and regulations, repairs by welding are permitted for ductile cast iron. All welding repairs shall be carried out in accordance with a written procedure.

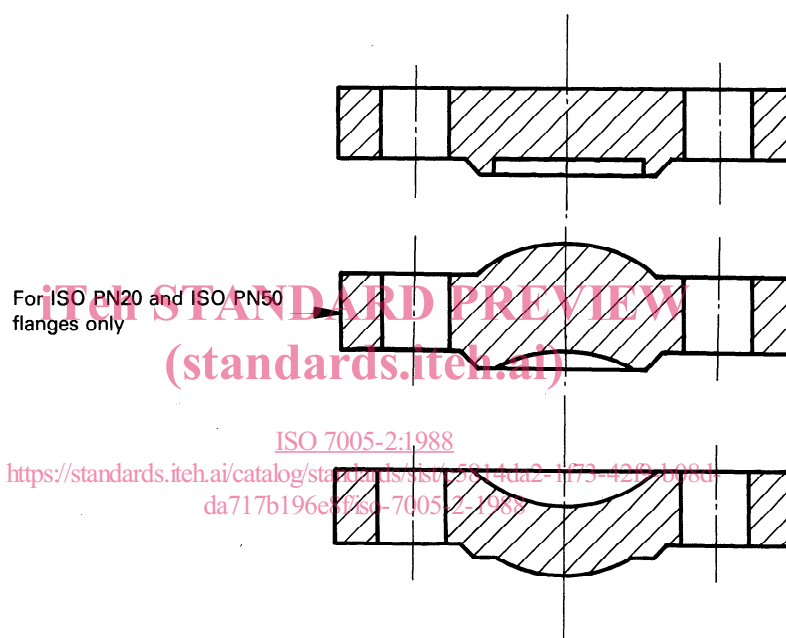
**2.9 Information to be supplied by the purchaser**

The following information should be supplied by the purchaser in the enquiry and/or order :

- a) number of this part of ISO 7005, i.e. ISO 7005-2;



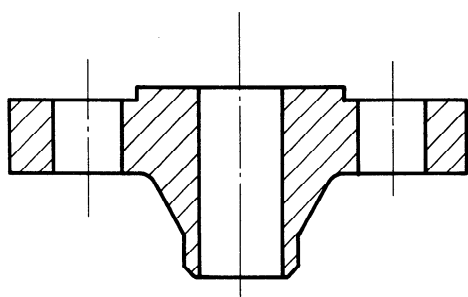
- b) nominal size — DN followed by the appropriate number (see 2.3.1);
- c) nominal pressure — ISO PN followed by the appropriate number (see 1.1);
- d) flange type number (see 1.3.2 and figure 1);
- e) facing type letter (see 1.3.2 and figure 2);
- f) material designation (see 2.2.1);
- g) for flange types 11, 12, 14 and 15, the external diameter and thickness of pipe to which the flange is to be attached (see note 3 to tables 6 to 13) when supplied loose, i.e. not as a component of some other fitting;
- h) type of thread for threaded flanges (type 13) when supplied loose, i.e. not as a component of some other fitting.



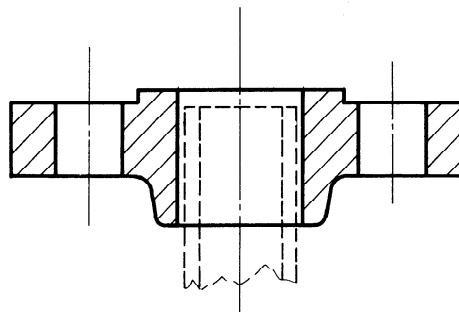
**Type 05**  
Blank flange

NOTE — See the note to 2.4.1 regarding the transition from the outside diameter of the raised face.

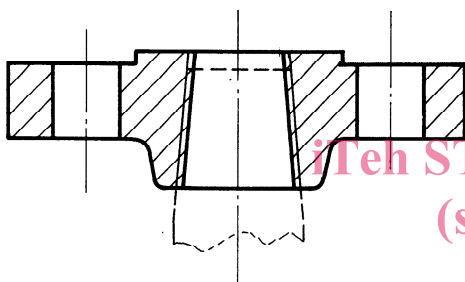
**Figure 1 — Types of flanges**



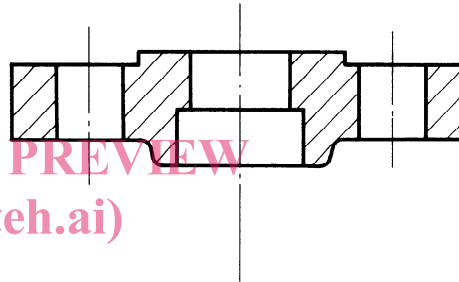
**Type 11**  
Welding neck flange



**Type 12**  
Hubbed slip-on flange for welding



**Type 13**  
Hubbed threaded flange

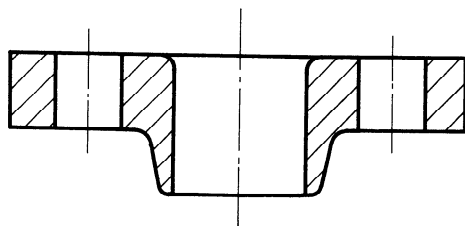


**Type 14**  
Hubbed socket welding flange

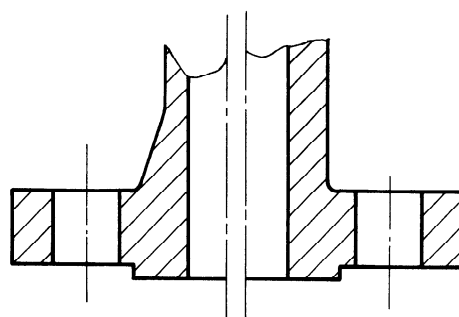
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**Type 15**  
Loose hubbed flange for lapped pipe end



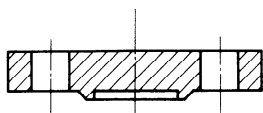
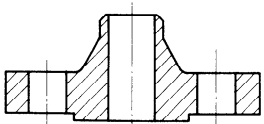
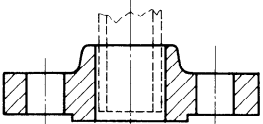
**Type 21**  
Integral flange

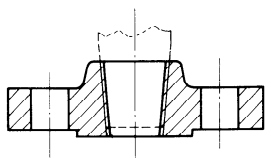
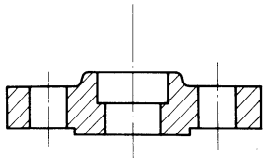
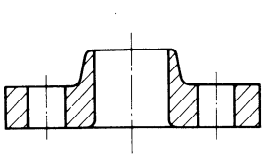
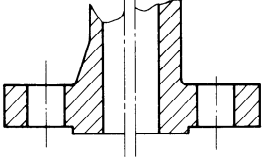
NOTE — See the note to 2.4.1 regarding the transition from the outside diameter of the raised face.

**Figure 1 — Types of flanges (concluded)**



Table 3 — Synoptic table for ductile cast iron flanges

Type No.	Table	DN																																						
		ISO PN		2,5	6	10	16	20	25	40	50	2,5	6	10	16	20	25	40	50	2,5	6	10	16	20	25	40	50													
 <p>06</p>	8	2,5																																						
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NOTE — A horizontal line indicates the range of nominal sizes (DN) in which flanges of a particular type and nominal pressure (ISO PN) may be ordered to this part of ISO 7005.